

## REMARKS

### Amendments:

There are no amendments to the claims or to any other part of the specification or to the drawings.

### Rejection of Claims Under 35 U.S.C. § 103:

Claims 1, 2, 4-11, 14, 15 and 36 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,838,035 to Ederer in view of U.S. Patent No. 6,405,095 to Jang et al. Claims 12, 13, 16, 17, and 37 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Jang as applied to claims 1, 2, 4-11, 14, 15 and 36 and further in view of U.S. Patent No. 5,510,066 to Fink et al. Claim 3 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Jang as applied to claims 1, 2, 4-11, 14, 15 and 36 and further in view of U.S. Patent No. 5,301,415 to Prinz et al. Claim 38 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Jang as applied to claims 1, 2, 4-11, 14, 15 and 36 and further in view of U.S. Patent No. 6,579,479 to Edie et al. Claims 21, 25 and 31-35 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Fink. Claims 22-24 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Fink as applied to claims 21, 25 and 31-35, and further in view of Jang.

The Applicants note that, of the pending claims, claims 1 and 21 are independent claims, while all other claims depend from claims 1 and 21, respectively.

The Applicants note the requirements for obviousness set forth by the United States Patent and Trademark Office ("USPTO"). First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; second, there must be a reasonable expectation for success; and, finally, the prior art references when combined must teach or suggest **all** the claim limitations. (MPEP 2142 (emphasis added).)

1 **Claim 1:**

2 Claim 1 requires at least the following limitations:

3 *ejecting drops of first and second different liquefied materials in a pattern and*  
4 *allowing the drops to solidify to form a layer of a three-dimensional object, wherein*  
5 *the second liquefied material is deposited to form portions of the layers which define*  
6 *an external surface of the three-dimensional object;*

7 *surrounding the layer with a viscous liquid and controlling the level of the*  
8 *viscous liquid to be essentially level with the uppermost level of the portion of the*  
9 *layer formed from the drops of liquefied material.*

10 The Examiner contends that Ederer teaches all the elements of Claim 1,  
11 except that "Ederer does not teach a first and second different deposited liquid  
12 where the second liquid forms an external surface." (Office action, page 4.) The  
13 Examiner contends that Jang teaches the remaining elements of claim 1 so that  
14 Ederer and Jang together render claim 1 obvious. (Id.)

15 The Applicants, however, respectfully disagree with the Examiner as to what  
16 Jang teaches. According to the teachings of Jang:

17 *Basically, the process comprises providing a focused heat source to*  
18 *maintain a small pool of molten material on the surface of a movable*  
19 *stage. The material in this pool is replenished, continuously or*  
20 *intermittently, by injecting metal and/or ceramic powder into this pool.*  
21 *The stage is controlled to move relative to the heat source to trace out*  
22 *the geometry of a bulky portion of a first layer for the desired object.*  
23 *The "scanning" of this pool (heat source-powder interaction zone)*  
24 *leaves behind a strand of molten material which substantially solidifies*  
25 *immediately after the material moves out of the heat affected zone.*  
*Other portions of an object, particularly those containing fine features*  
*of a layer, are built by ejecting and depositing fine liquid droplets for*  
*improved accuracy. Those two procedures are repeated concurrently*  
*or sequentially under the control of a CAD computer to deposit*  
*consecutive layers in sequence, thereby forming the desired 3-D*  
*object. The preferred heat source is a laser beam. Both liquid droplets*  
*and melt pool material compositions can be selected from a wide*

1 range of materials. Preferably, fine droplets of solidifiable liquid  
2 compositions are deposited to form a gradient-thickness zone to  
3 reduce or eliminate the staircase effect near any exterior peripheral  
4 zone. (Jang, col. 5, line 53 through col. 6, line 8.)

5 Thus, according to the teachings of Jang, a molten "weld pool" is maintained  
6 into which a first powdered material is applied to form the main portions of an object.  
7 Then, a second material in the form of liquid droplets is applied to fill in the "staircase  
8 effect" created by the weld pool process.

9 The Applicants contend that the processes disclosed by Ederer and Jang do  
10 not teach or suggest all the claim limitations, because neither Ederer nor Jang teach  
11 ejecting drops of first AND second different liquefied materials in a pattern and  
12 allowing the drops to solidify to form a layer of a three-dimensional object, wherein  
13 the second liquefied material is deposited to form portions of the layers which define  
14 an external surface of the three-dimensional object, as is required by claim 1.

15 The Examiner argues that Jang's teaching of applying a first powdered  
16 material to a weld pool in which the powder melts and applying a second material as  
17 liquid droplets is equivalent to the Applicants' aforementioned claim element  
18 because, according to the Examiner, the order in which heat is applied to liquefy, as  
19 in before or after deposition of material, does not carry weight.

20 That is, the Examiner is apparently arguing that only some claim elements  
21 carry weight, or in the alternative, not all claim elements carry weight. The  
22 Applicants, however, respectfully disagree. As is explained above, the USPTO has  
23 stated that obviousness requires the prior art references when combined must teach  
24 or suggest all the claim limitations. (MPEP, 2142 (emphasis added).) The  
25 Applicants assert that this requirement is very clear, and that it dictates that each  
and every claim limitation must be taught or suggested by the prior art. In other  
words, the legal standard of obviousness requires that ALL claim limitations  
carry weight.

It is also clear that Jang does not teach or suggest ejecting drops of first and  
second different liquefied materials. Rather, Jang expressly teaches application of  
a first material in powdered form and ejecting drops of a second liquefied material.  
That is, in simple terms, Applicants' claim 1 requires the application of liquid,

1 whereas Jang teaches the application of powder. Therefore, Jang does not teach or  
2 suggest the Applicants' claim limitations as is asserted by the Examiner.

3 In regard to suggestion or motivation to combine the teachings of Ederer and  
4 Jang, the Examiner states that "the switch of a powder deposition, which  
5 subsequently undergoes a phase change, for a liquid droplet deposition would have  
6 been obvious as a choice alternative for someone skilled in the art." (Office action,  
7 page 4.) The Applicants note, however, that "[a] statement that modifications of the  
8 prior art to meet the claimed invention would have been well within the ordinary skill  
9 of the art at the time the claimed invention was made ... is not sufficient to establish  
10 a *prima facie* case of obviousness without some objective reason to combine the  
11 teachings of the references." (MPEP 2143.01.) The Applicants assert that the  
12 Examiner has not indicated where, in the prior art, there is an objective reason to  
13 combine the teachings of Ederer with those of Jang, nor has the Examiner indicated  
14 what that objective reason is. That is, the Examiner has not provided a logical  
reason apparent from positive, concrete evidence that justifies the combination of  
the references, as is required. (In re Laskowski, 871 F.2d 115, 10 USPQ2d 1397  
(Fed. Cir. 1985).)

15 The Examiner contends that "Ederer and Jang are combinable because they  
16 are concerned with a similar technical field, namely, rapid prototyping." (Office  
17 action, page 5.) The Applicants point out that many reference teachings can be  
18 combined, but that fact is insufficient to establish *prima facie* obviousness. As  
19 restated by the USPTO, "[t]he mere fact that references can be combined or  
20 modified does not render the resultant combination obvious unless the prior art also  
suggests the desirability of the combination." (MPEP 2143.01 (emphasis added).)  
21 As has already been pointed out, the Examiner has not indicated where the  
22 suggestion of the desirability of the combination is to be found in the prior art.

23 The Applicants note further that evidence showing there was no reasonable  
24 expectation of success may support a conclusion of nonobviousness. (MPEP  
25 2143.02.) Additionally, prior art that teaches away is evidence of nonobviousness.  
(MPEP 2145.) A prior art reference may be considered to teach away when "a  
person of ordinary skill, upon reading the reference, would be discouraged from  
following the path set out in the reference." (In re Gurley, 27 F.3d at 553, 31 USPQ  
2d at 1131 (Fed. Cir. 1994).) Moreover, it has been held that an invention is not

1 obvious where one prior art reference teaches away from combination with a second  
2 prior art reference. (*In re* Rudko, Civ. App. No. 98-1505 (Fed. Cir. May 14,  
3 1999)(unpublished).)

4 As the Examiner has pointed on in the Office action, Ederer teaches that the  
5 liquid support fluid wets the top surface of the object, and that the liquid support fluid  
6 impregnates the structure of the object. (Office action, page 3.) As is discussed  
7 herein above, the method taught by Jang, on the other hand, depends upon  
8 maintaining a molten weld pool on the top surface of the object into which powdered  
9 material is deposited.

10 The Applicants assert that anyone skilled in the art, upon reading the  
11 teachings of Jang, would be discouraged from using the liquid support fluid taught by  
12 Ederer, as is also claimed by the Applicants, because such liquid support fluid  
13 wetting the top surface of the object and impregnating the object would impede the  
14 maintenance of the molten weld pool and/or would cause the powdered material to  
15 disperse before melting. The Applicants also assert that this dichotomy in the  
16 teachings of Ederer and Jang is evidence showing no reasonable expectation of  
17 success in combining the teachings of these references.

18 In view of the foregoing, the Applicants contend that the Examiner has not  
19 established a *prima facie* case of obviousness in regard to claim 1 because it is  
20 clearly evident, as is explained above, that: (1) the references relied upon by the  
21 Examiner do not teach all the claim limitations; (2) there is no suggestion or  
22 motivation, either in the references themselves or in the knowledge generally  
23 available to one of ordinary skill in the art, to combine reference teachings; and (3)  
24 there is no reasonable expectation of success.

25 For at least the reasons set forth herein above, claim 1 is not obvious over the  
cited prior art. Accordingly, the Applicants respectfully request that the rejection of  
claim 1 be withdrawn and the claim be allowed.

Inasmuch as claims 2-17 depend from claim 1, it is therefore logical that each  
of claims 2-17 are also not obvious over the cited prior art for at least the reasons  
that claim 1 is not obvious, as set forth herein above. Accordingly, the Applicants  
respectfully request that the rejections of each of claims 2-17 under 35 U.S.C. 103  
be withdrawn and the claims be allowed.

1 **Claim 21:**

2 Claim 21 requires at least the following limitations:

3 *ejecting drops of liquefied material into a vat using an ejector;*

4 *scanning the ejector in first and second mutually opposed directions to*  
5 *deposit and solidify said drops in a predetermined pattern to sequentially form layers*  
6 *of the three-dimensional object;*

7 *supplying a viscous liquid into the vat to a level which is essentially level with*  
8 *the top of a most recently formed layer of the three-dimensional object, wherein said*  
9 *viscous liquid both supports the material being formed into a three-dimensional*  
10 *object and fills in voids between drops of the material forming the three-dimensional*  
11 *object; and*

12 *removing the object from the viscous liquid in the vat and then solidifying the*  
13 *viscous liquid remaining in the voids between solidified drops of the material forming*  
14 *the object.*

15 The Examiner contends that Ederer teaches all the limitations of claim 21,  
16 except that Ederer does not teach "solidifying the thus invested fluid." (Office action,  
17 page 9.) The Examiner further contends that Fink teaches the missing limitations of  
18 claim 21 so that Ederer and Fink together, teach all the limitations of claim 21.

19 The Applicants respectfully disagree with the Examiner's contention that  
20 Ederer, together with Fink, teach all the limitations of claim 21. According to the  
21 teachings of Fink:

22 *A preparing of a self-supporting or free-standing three-dimensional*  
23 *unitary structural body by a method including generating successively*  
24 *a plurality of cross-sectional layers joined together to form the body*  
25 *and with the generating of a cross-sectional layer comprising placing a*  
*plurality of drops of a liquid composition, containing a first reactant, in a*  
*pattern of discrete drops making up the cross-sectional layer and*  
*subsequently placing a plurality of discrete drops of other liquid*  
*composition, containing another reactant, in contact with the placed*  
*drops in the pattern so that the first reactant and the other reactant*  
*react to provide a solid. (Fink, abstract.)*

1 Thus, according to the teachings of Fink, droplets of a material containing a  
2 first reactant are ejected in a given cross-sectional pattern, then droplets of a  
3 material containing a second reactant are ejected in the given cross-sectional pattern  
4 so that the material containing the second reactant is applied adjacent to, and in  
5 contact with, the material containing the first reactant. Upon coming into contact with  
6 one another, the first reactant reacts with the second reactant to form a solid layer of  
7 material. In this manner, repeated alternate applications of the material containing  
8 the first reactant and the material containing the second reactant accumulate to form  
9 a unitary structural body. This concept is illustrated by Figs. 3 and 4 of Fink.

10 It is thus evident that Fink does not teach or suggest the missing claim  
11 limitation that is not taught by Ederer, which claim limitation is removing the object  
12 from the viscous liquid in the vat and then solidifying the viscous liquid remaining in  
13 the voids between solidified drops of the material forming the object. Rather, Fink  
14 teaches that the two materials are applied as ejected droplets, and that the two  
15 materials solidify upon contact with one another. That is, Fink simply does not teach  
16 or suggest all the claim limitations as is required for *prima facie* obviousness.

17 In regard to the rejection of claim 21, the Examiner argues that "it is a matter  
18 of *prima facie* obviousness that any porous object submerged in a liquid would be  
19 impregnated by that liquid" and that "Ederer teaches a supporting fluid wherein and  
20 whereon a patterned deposition in liquid droplet form is solidified into an object, and  
21 it follows that impregnation and occlusion of voids would result." (Office action,  
22 page 13.)

23 The Applicants contend that, even if this was true, it still does not amount to a  
24 teaching or suggestion of all the claim limitations. Again, Ederer and Fink do  
25 together simply do not teach or suggest all of the limitations of claim 21. But, even if  
Ederer and Fink did teach all the claim limitations (which the Applicants do not  
concede), this alone would still not be sufficient to establish *prima facie* obviousness.  
As is stated above, obviousness also requires some suggestion or motivation, either  
in the references themselves or in the knowledge generally available to one of  
ordinary skill in the art, to modify the reference or to combine reference teachings,  
as well as requiring a reasonable expectation for success. The Examiner has not  
provided a logical reason apparent from positive, concrete evidence that justifies the

1 combination of the references, as is required. (In re Laskowski, 871 F.2d 115, 10  
2 USPQ2d 1397 (Fed. Cir. 1985).)

3 Moreover, the Applicants assert that Fink teaches away from both Ederer and  
4 the claimed invention, and/or that there would have been no reasonable expectation  
5 of success in modifying and/or combining the reference teachings. Fink teaches a  
6 method and/or apparatus that produces a **solid** object. (Fink, abstract and col. 7,  
7 lines 5-12.) The **solid** object taught by Fink is contrasted with the **porous** object  
8 claimed by the Applicants. The solid object taught by Fink does not, by its nature,  
9 contain voids that can be filled with viscous liquid, as is required by claim 21.

10 Moreover, Fink teaches various means of **removing** any liquid from the area of  
11 object being formed. (Fink, col. 6, lines 10-41.) That is, according to the teachings  
12 of Fink, having liquid in and/or around the object being formed is undesirable and  
13 accordingly, Fink teaches various means of removing liquid from the object begin  
14 formed and from the area around the object. This is in contrast with claim 21, in  
15 which it is desirable for the viscous liquid to fill the voids of the object.

16 In light of the fact that Fink teaches the production of a solid object while the  
17 Applicants' claim 21 depends upon the production of a porous object having voids  
18 which are filled by the viscous liquid, and in view of the fact that Fink teaches that  
19 liquid is to be removed from the object while in claim 21 liquid surrounding the object  
20 is desirable, it follows that one of ordinary skill in the art would be discouraged from  
21 modifying the teachings of Fink to result in Applicants' claim 21. In the alternative,  
22 one of ordinary skill in the art would see no reasonable expectation of success in  
23 modifying Fink, and/or in combining the teachings of Fink with those of Ederer.

24 Based on the foregoing, the Applicants contend that the Examiner has not  
25 established a *prima facie* case of obviousness in regard to claim 21 because it is  
clearly evident, as is explained above, that: (1) the references relied upon by the  
Examiner do not teach all the claim limitations; (2) there is no suggestion or  
motivation, either in the references themselves or in the knowledge generally  
available to one of ordinary skill in the art, to combine reference teachings; and (3)  
there is no reasonable expectation of success.

For at least the reasons set forth herein above, claim 21 is not obvious over  
the cited prior art. Accordingly, the Applicants respectfully request that the rejection  
of claim 21 be withdrawn and the claim be allowed.



1 Inasmuch as claims 22-25 and 31-38 depend from claim 21, it is therefore  
2 logical that each of claims 22-25 and 31-38 are also not obvious over the cited prior  
3 art for at least the reasons that claim 21 is not obvious, as set forth herein above.  
4 Accordingly, the Applicants respectfully request that the rejections of each of claims  
5 22-25 and 31-38 under 35 U.S.C. 103 be withdrawn and the claims be allowed.

6 Petition/Request for Extension of Time:

7 The Applicants herewith petition the Commissioner of Patents and  
8 Trademarks under 37 CFR § 1.136(a) to extend the time for reply to the Final action  
9 dated December 05, 2006 for two (2) months from March 05, 2007 to May 05, 2007.  
10 Please find the enclosed authorization to charge the Assignee's deposit account in  
11 the amount to cover the cost of the extension as specified on the attached  
12 Transmittal Letter.

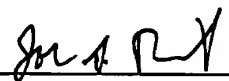
13 **SUMMARY**

14 The Applicants believe this response/amendment (RCE) constitutes a full and  
15 complete reply to the Final Action mailed December 05, 2006 and to the Advisory  
16 Action mailed 02/22/2007. The Applicants respectfully request timely allowance of  
17 claims 1-17, 21-25 and 31-38.

18 Respectfully submitted,

19 Alfred I-Tsung PAN and  
20 Laurie S. MITTELSTADT, Applicants

21 Date: May 1, 2007

22 By:   
23 John S. Reid  
24 Attorney and agent for Applicants  
25 Reg. No. 36,369  
Phone: (509) 534-5789